

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of claims:

Claims 1-19 (canceled)

Claim 20 (new): A hydrogen gas humidity control apparatus, comprising:

a first hydrogen flow path or chamber thereof to which at least hydrogen gas is supplied;

a second hydrogen flow path or chamber thereof to which at least hydrogen gas is supplied; and

a moisture carrier for separating the first hydrogen flow path or chamber thereof from the second hydrogen flow path or chamber thereof and for allowing at least one of water and water vapor to pass therethrough.

Claim 21 (new): The hydrogen gas humidity control apparatus according to claim 20, wherein

the hydrogen gas is hydrogen gas generated by fuel reforming.

Claim 22 (new): A hydrogen gas humidity control apparatus, comprising:

a first hydrogen flow path or chamber thereof to which at least hydrogen gas is supplied;

a second hydrogen flow path or chamber thereof to which at least hydrogen gas is supplied; and

a proton conductor for separating the first hydrogen flow path or chamber thereof from the second hydrogen flow path or chamber thereof.

Claim 23 (new): The hydrogen gas humidity control apparatus according to claim 22, wherein

the proton conductor has a catalyst disposed on at least one surface of the proton conductor selected from a surface facing the first hydrogen flow path or chamber thereof and a surface facing the second hydrogen flow path or chamber thereof.

Claim 24 (new): The hydrogen gas humidity control apparatus according to claim 22, further comprising:

a first voltage application electrode associated with the first hydrogen flow path or hydrogen chamber;

a second voltage application electrode associated with the second hydrogen flow path or hydrogen chamber; and

the proton conductor is sandwiched between the first voltage application electrode and the second voltage application electrode.

Claim 25 (new): The hydrogen gas humidity control apparatus according to claim 22, wherein

a voltage is applied to a portion between the first voltage application electrode and the second voltage application electrode.

Claim 26 (new): The hydrogen gas humidity control apparatus according to claim 23, wherein

the catalyst contains platinum.

Claim 27 (new): The hydrogen gas humidity control apparatus according to claim 22, wherein

the hydrogen gas is hydrogen gas generated by fuel reforming.

Claim 28 (new): A fuel cell, comprising:

at least one power-generating cell having

 a fuel electrode-side separator to which a fuel is supplied,

 an oxidizer electrode-side separator to which an oxidizer is supplied, and

 a proton conductor membrane electrode assembly sandwiched between the fuel electrode-side separator and the oxidizer electrode-side separator; and

 at least one hydrogen gas humidity control apparatus, which is incorporated to at least one of a hydrogen flow path and a hydrogen chamber to which the fuel is supplied;

wherein the hydrogen gas humidity control apparatus having

 a first substrate,

 a second substrate, and

 a moisture carrier sandwiched between the first substrate and the second substrate;

wherein a mixed gas of at least one of hydrogen and water and water vapor is in contact with the first substrate and at least hydrogen is in contact with the second substrate.

Claim 29 (new): A fuel cell, comprising:

one or more power-generating cell having

 a fuel electrode-side separator to which a fuel is supplied,

 an oxidizer electrode-side separator to which an oxidizer is supplied,

and

 a proton conductor membrane electrode assembly sandwiched between the fuel electrode-side separator and the oxidizer electrode-side separator; and

 at least one hydrogen gas humidity control apparatus, which is incorporated to a hydrogen flow path and/or hydrogen chamber to which the fuel is supplied;

wherein the hydrogen gas humidity control apparatus having

 a first electrode,

 a second electrode, and

 a proton conductor sandwiched between the first electrode and the second electrode;

wherein a mixed gas of at least one of hydrogen and water and water vapor is in contact with the first electrode and at least hydrogen is in contact with the second electrode.

Claim 30 (new): A hydrogen gas humidity control method, comprising:

 holding a proton conductor by sandwiching between a first electrode and a second electrode; and

 applying a voltage to a portion between the first electrode and the second electrode wherein an amount of moisture is carried between hydrogen supplied from a fuel electrode of a fuel cell and hydrogen in contact with the second electrode and having a humidity different from that of the hydrogen in contact with the first electrode.

Claim 31 (new): A fuel cell, comprising
a power-generating cell having an electrolyte sandwiched between a fuel electrode and an oxygen electrode;
an oxygen electrode-side separator having formed therein an oxygen flow path through which oxygen is supplied to the oxygen electrode;
a fuel electrode-side separator having formed therein a fuel flow path through which fuel gas is supplied to the fuel electrode; and
a moisture carrier disposed in contact with the fuel gas and in contact with discharged gas having a humidity different from that of the fuel gas to carry moisture between the fuel gas and the discharged gas.

Claim 32 (new): The fuel cell according to claim 31, comprising a discharge flow path through which discharged gas flows.

Claim 33 (new): The fuel cell according to claim 31, wherein
the fuel cell has a plurality of the power-generating cells;
the moisture carrier is disposed between a first power-generating and a second power-generating; and
the discharged gas in contact with the moisture carrier contains oxygen and is supplied to the second power-generating cell.

Claim 34 (new): The fuel cell according to claim 31, wherein the moisture carrier contains a perfluorosulfonic acid polymer.

Claim 35 (new): The fuel cell according to claim 31, wherein air existing outside of the fuel cell is used as the discharged gas.

Claim 36 (new): A humidity control method for a fuel cell, comprising:

providing a moisture carrier so as to be in contact with fuel gas to be supplied to the fuel electrode side of a fuel cell;

separating discharged gas having a humidity different from that of the fuel gas and the fuel gas by the moisture carrier; and

carrying moisture between the fuel gas and the discharged gas using the moisture carrier.

Claim 37 (new): The humidity control method for a fuel cell according to claim 36, wherein

the discharged gas contains oxygen and is supplied to an oxygen electrode side of the fuel cell.

Claim 38 (new): The humidity control method for a fuel cell according to claim 36, wherein

air existing outside of the fuel cell is used as the discharged gas.